

## Appendix A.

USFWS Interim Voluntary Guidelines Site Development Recommendations	Proposed Kahuku Wind Power Project
Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the Federal Endangered Species Act	No locations on O'ahu were identified that were unlikely to be visited by listed species and were deemed suitable to support a financially viable wind energy generation facility. On-site surveys indicate that the risk to listed species is low, as none of the documented species have been observed utilizing the site and only three (two bird species and one bat species) are known to transit over the site infrequently. The project will reduce risk to listed species as much as possible while achieving the basic project purpose.
Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated, unless mortality risk is low (e.g., birds present rarely enter the rotor-swept area). Examples of high concentration areas for birds are wetlands, State or Federal refuges, private duck clubs, staging areas, rookeries, leks, roosts, riparian areas along streams, and landfills. Avoid known daily movement flyways (e.g., between roosting and feeding areas) and areas with a high incidence of fog, mist, low cloud ceilings, and low visibility.	No wetlands occur on the project area. Site-specific surveys indicate that the project area is not located along any of the daily movement flyways used by wetland birds and is consistently a location of high visibility with high cloud ceilings.
Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas.	The project area has shown a very low level of bat activity confined to the northern boundary. It is likely that only a few individuals, if any, use the project area.
Configure turbine locations to avoid areas or features of the landscape known to attract raptors (hawks, falcons, eagles, owls). For example, Golden Eagles, hawks, and falcons use cliff/rim edges extensively; setbacks from these edges may reduce mortality. Other examples include not locating turbines in a dip or pass in a ridge, or in or near prairie dog colonies.	The only likely raptor to be present on site is the Hawaiian short-eared owl or pueo, which has only been observed on the site once during the 15 month long survey. All observations thus far have indicated that Kahuku Wind Power is not located at a site that is attractive to raptors.
Configure turbine arrays to avoid potential avian mortality where feasible. For example, group turbines rather than spreading them widely, and orient rows of turbines parallel to known bird movements, thereby decreasing the potential for bird strikes. Implement appropriate storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species (e.g., Sage Grouse).	Turbines have been grouped as closely as feasible, given wind resource and terrain considerations. No water features will be constructed and on-site drainage will be maintained so as not to attract waterbirds.

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Avoid fragmenting large, contiguous tracts of wildlife habitat. Where practical, place turbines on lands already altered or cultivated, and away from areas of intact and healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas.	The project area has been extensively grazed and cultivated in the past and does not contain any healthy native habitat.
Avoid placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds).	Not applicable as no prairie grouse occur in Hawai'i.
Minimize roads, fences, and other infrastructure. All infrastructure should be capable of withstanding periodic burning of vegetation, as natural fires or controlled burns are necessary for maintaining most prairie habitats.	The proposed access roads and infrastructure are designed to be the minimum necessary to construct and operate the project while observing good engineering and environmental design standards. No periodic burning is necessary at the project area.
Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. For example, avoid attracting high densities of prey animals (rodents, rabbits, etc.) used by raptors.	Vegetation that will be removed from the site during construction will be replaced with appropriate vegetation to ensure stable cover. Some areas may be planted with native vegetation, providing additional habitat enhancement to a landscape dominated by alien vegetation.
Reduce availability of carrion by practicing responsible animal husbandry (removing carcasses, fencing out cattle, etc.) to avoid attracting Golden Eagles and other raptors.	This recommendation is not applicable to projects on O'ahu.
Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities. Avoid placing external ladders and platforms on tubular towers to minimize perching and nesting. Avoid use of guy wires for turbine or meteorological tower supports. All existing guy wires should be marked with recommended bird deterrent devices (Avian Power Line Interaction Committee 1994).	Tubular towers will be utilized for the turbine towers. The towers will not have platforms or ladders. The only permanent met tower will be unguyed.

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<p>If taller turbines (top of the rotor-swept area is &gt;199 feet above ground level) require lights for aviation safety, the minimum amount of pilot warning and obstruction avoidance lighting specified by the FAA should be used (FAA 2000). Unless otherwise requested by the FAA, only white strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA. Solid red or pulsating red incandescent lights should not be used, as they appear to attract night-migrating birds at a much higher rate than white strobe lights.</p>	<p>A subset of turbines as determined by FAA will be lit with medium intensity red-flashing lights in accordance with FAA aviation safety guidance. For the clustered arrangement proposed by Kahuku Wind Power, current FAA guidance prescribes a single red pulsing light on turbines located around the outside of the grouping, at a spacing of no more than 2,500 ft between lighted turbines. Kahuku Wind Power will request the maximum flash interval to minimize lighting impact. White strobe lights do not conform to FAA guidance. On-site lighting will be minimal and shielded so as not to attract night-migrating birds.</p>
<p>Where the height of the rotor-swept area produces a high risk for wildlife, adjust tower height where feasible to reduce the risk of strikes.</p>	<p>Roughly 95-100% of the endangered waterbird species observed in the adjacent wetlands fly below the rotor swept zone of the chosen turbine. The risk to seabirds is higher with 64% of all birds expected to fly at turbine height or lower; however, seabird traffic is extremely low over the site.</p>
<p>Where feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds. Use recommendations of the Avian Power Line Interaction Committee (1994, 1996) for any required above-ground lines, transformers, or conductors.</p>	<p>This recommendation is being followed; all new power lines will be placed underground where feasible.</p>
<p>High seasonal concentrations of birds may cause problems in some areas. If, however, power generation is critical in these areas, an average of three years monitoring data (e.g., acoustic, radar, infrared, or observational) should be collected and used to determine peak use dates for specific sites. Where feasible, turbines should be shut down during periods when birds are highly concentrated at those sites.</p>	<p>This recommendation is not applicable as there were no observed seasonal concentrations of birds passing over the site. Though seabirds and ducks have been documented to pass through the site, the passage rates are low compared to other locations in Hawai'i. Preliminary results of on-going acoustic bat monitoring indicate low levels of bat activity in the project area.</p>
<p>When upgrading or retrofitting turbines, follow the above guidelines as closely as possible. If studies indicate high mortality at specific older turbines, retrofitting or relocating is highly recommended.</p>	<p>This recommendation is not applicable to the current project as it will be a new facility.</p>